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Float actuated fluid dispensing device

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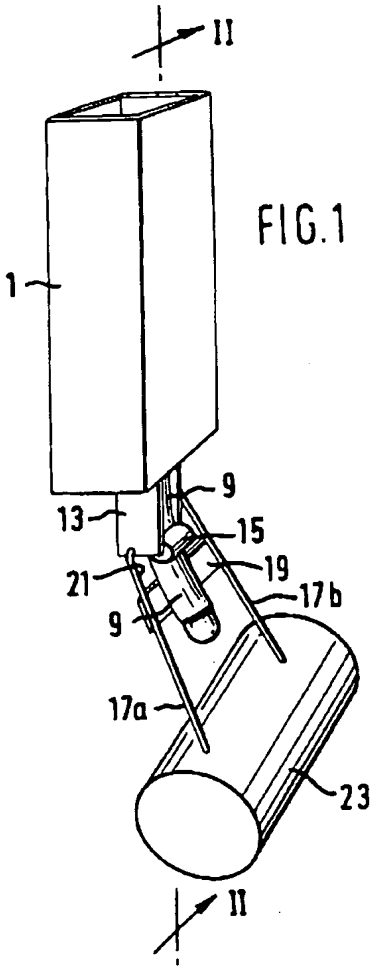

FIG.1

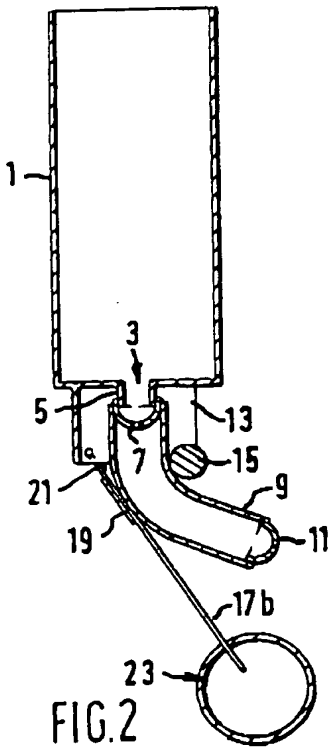

FIG.2

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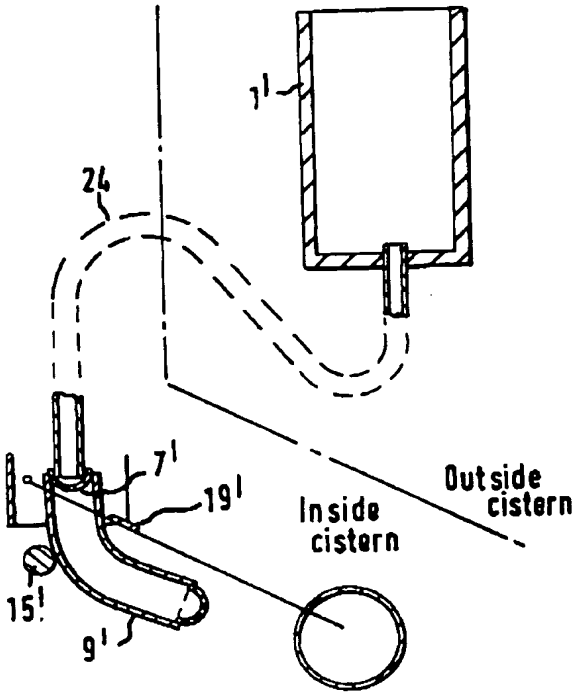

FIG.3

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Float-Actuated Fluid Dispensing Device

This invention relates to a device for dispensing quantities of fluid from a source of fluid to a reservoir. Typically, but not exclusively, such a device may be used in a lavatory cistern to add quantities of disinfectant, perfume or deodorant to the water in the cistern.

It is difficult to ensure that additives, be they in the form of solids or liquids, are dispensed into a lavatory cistern at consistent concentrations. The concentration of additives from a solid in the cistern will, or course, depend on the length of time between successive flushes of the lavatory. Similar problems arise with a fluid additive gradually leaching out from a semi-pervious container.

Several devices, such as those described in UK Patent Specification Nos. 876,823, 1,069,213 and 1,044,573, overcome this problem by dispensing additive fluid into water being release from the cistern upon flushing. The present invention approaches the problem differently, however, and is concerned, in a preferred embodiment, with supplying additive fluid to the cistern itself so as to prevent or impede the growth of any undesired microbiological contaminants in the cistern and/or bowl or urinal. European Patent Application No. 80 102 391.2 (Publication No. 0 018 648) describes a device which causes additive fluid to be dispensed from a source of additive fluid into a W.C. cistern. The pumping device of European Patent Application No. 80 102 391.2 relies on the movement of a float with the fall and rise of water in the cistern as it is flushed. The float is attached to the end of a resiliently deformable tube which bears against an abutment as the float rises; air is thereby expelled fromthe resiliently deformable tube and, by a complex series of valves, the expelled air drives additive fluid from one or more sources of additive fluid into the cistern. The structure of this device is bulky and employs a large number of parts.

According to the present invention, there is provided a device suitable for dispensing fluid from a source of the fluid to a reservoir for a liquid, which device comprises: a first one-way valve through which fluid from the source may flow; a second one-way valve; connecting means between the first and second one-way valves at least a portion of which connecting means is

resiliently deformable; an abutment; and a float mountable in the reservoir such that the float is movable in response to a change in liquid level in the reservoir to cause the resiliently deformable portion to deform against the abutment to decrease the volume of the connecting means to expel fluid from the connecting means through the second one-way valve to the reservoir.

Preferably the connecting means is adapted so that the fluid, when flowing between the two one-way valves, flows past and is in contact with the resiliently deformable portion.

Suitably, substantially the entirety of the connecting means is resiliently deformable.

The float is preferably pivotally movable with respect to the abutment and carries a flange suitable for moving the connecting means to deform against the abutment. However, in another possible embodiment, the abutment may be fixed with respect to the float and be caused to move against a flange and thereby deform the resiliently deformable portion of the connecting means.

The one-way valves, may, for the sake of simplicity and cheapness, be bunsen valves formed of silicone rubber. Other suitable valve constructions may, however, be used.

Preferably, the device also comprises governing means to determine how much fluid will be dispensed each time the liquid in the reservoir falls and rises. The governing means can conveniently take the form of a first protrusion fixed with respect to the float which can bear against a second protrusion fixed with respect to the abutment.

The deforming of the resiliently deformable portion of the connecting means against the abutment may be caused by a rise in liquid level in the reservoir or a fall in the liquid level in the reservoir.

A fluid suitable for being added to a lavatory cistern comprises a mixture of amphoteric detergent, a polycarboxylic acid, a bacteriocide and optionally a perfume oil. The source of fluid may be a rigid, fluid-tight container which can be provided with a window for the detection of level of fluid in the container. Such a container can be conveniently mounted on the inside of the lavatory cistern with its top above the high water mark. Alternatively, the source of

fluid may comprise a disposable sachet of fluid, which is piercable by a hollow needle whose interior communicates with the first one-way valve.

For a better understanding of the present invention, and to show how it may be put into effect, reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 shows a perspective view of a first device in accordance with the invention;

Figure 2 shows a vertical cross-section view of the device taken along the line II-II of Figure 1; and

Figure 3 shows a section similar to Figure 2 of a second device in accordance with the invention.

Referring now to the drawings, Figures 1 and 2 show an open-topped generally flat vertically arranged cuboid container 1, which functions as a source of fluid, having a single opening 3, through which fluid may flow. The opening 3 is surrounded by a cylindrical flange 5, over which is mounted a first bunsen valve 7 made of silicone rubber. Over the first bunsen valve 7 is fitted one end of a resiliently deformable silicone rubber or neoprene tube 9, which functions as a connecting means. The other end of the tube 9, which is free, fits over a second bunsen valve 11, which is also made out of silicone rubber or Neoprene.

A U-sectioned member 13 depends from the bottom surface of the container 1, partially surrounding the flange 5 round the opening 3. The tube 9 runs the length of the U-sectioned member 13 and projects from its end. Wedged between the arms of the bottom end of the U-sectioned member is a circular-sectioned cylindrical wedge 15 which serves as an abutment. The tube 9 passes between the wedge 15 and the bottom of the U-sectioned member 13.

Twin pivot arms 17a and 17b share a common journal which penetrates two walls of the U-section member 13 and spans the U-sectioned member 13 adjacent its back wall. The two pivot arms extend, slightly divergently, in a plane generally down and away from the container 1. Between the pivot arms 17a and 17b is a plastics material plate 19 positioned so that it can bear on the lower end of the tube 9 near the second bunsen valve 11. The tube 9 passes between the plate 19

and the wedge 15; this has two consequences: first the tube 9 will not lie in a straight line but will be bent and, secondly, the tube may be deformed between the plate 19 and the wedge 15 and its volume thereby decreased. It will be appreciated that the extent of pivotal movement of the pivot arms 17a and 17b determines the amount by which the tube 9 can be depressed, to limit this movement of the pivot arms, one or more lugs 21 are attached to the or each pivot arm. The lugs 21 can then abut with the lower edge of the U-sectioned member 13 to limit the movement of the pivot arms 17a and 17b.

The free ends of the pivot arms 17a and 17b extend into and are secured in the curved surface of a float 23 which is a hollow cylinder of circular cross-section. The float 23 may be made of plastics material. The cylindrical axis of the float 23 lies in the plane shared by the pivot arms 17a and 17b.

The operation of the device will now be described. The device shown in Figures 1 and 2 is mounted in an empty lavatory cistern and water is allowed to fill the cistern. As this happens, the float 23 will rise and the pivot arms 17a and 17b will pivot, with respect to the U-sectioned member 13 about their axis. The plate 19 will bear against the resiliently deformable tube 9 and squeeze it against the wedge 15. As the device is not yet charged with additive fluid, all that will happen is that air will be expelled through the second bunsen valve 11.

When the cistern is full, additive fluid is place in the container 1. The first bunsen valve 7 is too stiff to allow fluid to pass into the body of the tube 9, which therefore remains empty of fluid to pass into the body of the tube 9, which therefore remains empty of fluid. When the cistern is emptied by flushing the lavatory, the float 23 will fall and the plate 19 will therefore move away from the wedge 15, causing the expansion of the volume of the space in the tube 9. Atmospheric pressure.now forces fluid from the container 1 through the first bunsen vlave 7 into the tube 9.

After the cistern has emptied it begins to fill again. This time, as the plate 19 gradually squeezes tube 9 against wedge 15, the volume within the tube 9 is decreased and fluid is expelled through the second busen valve 11 into the cistern. The fist bunsen valve 7 effectively stops fluid being forced back into the container 1, but allows the tube 9 to be re-charged with fluid from the container 1 when the level of water in the cistern next falls.

The device described above is particularly appropriate when the operation of the cistern is such that is is normally empty of water but from time to time fills and then immediately empties again, for example because it is fitted with a regulatory device of the type described in our co-pending British Patent Application No 2 100 312A. The compressible tube 9 will therefore normally be relaxed; this prolongs its effective life.

A modified embodiment is shown diagrammatically in Figure 3 and is suitable for a cistern which is normally filled with water but which from time to time empties and then immediately fills again. In this embodiment, the plate 19' is above the tube 9', and the wedge abutment 15' is below the tube. Thus, for most of the time, the tube is relaxed, and is compressed only during the relatively brief emptying and refilling of the cistern. As in the case of the embodiment shown in Figures 1 and 2, this arrangement is intended to prolong the life of the tube.

The Figure 3 embodiment differs from the Figure 2 embodiment also in that reservoir 1' of additive fluid is outside the cistern and is connected to the first bunsen valve 7' by a length of tubing 24. The tubing 24 may be of any suitable material, for example plastics or metal, but stainless steel is preferred as it is robust, smart and unlikely to react with the additive fluid. Locating the reservoir 1' outside the cistern generally allows the reservoir to be refilled with additive fluid more readily, and the reservoir may be housed together with, for example, a perfume dispensing device or the like mounted on an adjoining wall.

CLAIMS

1. A device suitable for dispensing fluid from a source of the fluid to a reservoir for a liquid, which device comprises: a first one-way valve through which fluid from the source may flow; a second one-way valve; connecting means between the first and second one-way valves at least a portion of which connecting means is resiliently deformable; an abutment; and a float mountable in the reservoir such that the float is movable in response to a change in liquid level in the reservoir to cause the resiliently deformable portion to deform against the abutment to decrease the volume of the connecting means to expel fluid from the connecting means through the second one-way valve to the reservoir.

2. A device as claimed in claim 1 wherein the connecting means is adapted so that the fluid, when flowing between the two one-way valves, flows past and is in contact with the resiliently deformable portion.

3. A device as claimed in claims 1 or 2 wherein substantially the entirety of the connecting means is resiliently deformable.

4. A device as claimed in any of claims 1-3 wherein the resiliently deformable portion of the connecting means is formed of silicone rubber.

5. A device as claimed in any of claims 1-4 wherein the float is pivotally movable.

6. A device as claimed in any of claims 1-5 wherein the float is movable with respect to the abutment.

7. A device as claimed in any one of claims 1-6 wherein the one-way valves are bunsen valves.

8. A device as claimed in claim 7 wherein the bunsen valves are formed of silicone rubber.

9. A device as claimed in any of claims 1-8 wherein the device additionally comprises a means of limiting the extent of movement of the float, thereby regulating the quantity of fluid to be dispensed.

10. A device as claimed in any of claims 1-9 wherein the deforming of the resiliently deformable portion of the connecting means against the abutment is caused by a rise in liquid level in the reservoir.

11. A device as claimed in any of claims 1-9 wherein the deforming of the resiliently deformable portion of the connecting means against the abutment is caused by a fall in the liquid level in the reservoir.

12. A device as claimed in any of claims 1-11 whenever used to introduce fluid into a W.C. cistern.

13. A device as claimed in any of claims 1-12 in combination with a source of fluid mountable inside the reservoir.

14. A device as claimed in any of claims 1-12 in combination with a source of fluid mountable outside the reservoir.

15. A method of dispensing a fluid into a reservoir for a liquid, which method comprises using a change in the level of liquid in the reservoir to move a float so as to compress, and thereby expel the fluid from, a connecting means located between first and second one-way valves, the expelled fluid passing through the second valve into the reservoir.

16. A device substantially as described herein with reference to Figures 1 and 2 of the accompanying drawings.

17. A device substantially as described herein with reference to Figure 3 of the accompanying drawings.